Meade® Smart Drive™

Permanent Periodic Error Correction (PPEC) for Meade LX200GPS Telescopes

Included as *standard equipment* with all Meade LX200GPS Schmidt-Cassegrain telescopes, and with the #1664 and #1697 drive systems of Meade apochromatic refractors *(p. 64)* as well, the Smart Drive permits a professional level of drive-rate precision. No longer are large worm gear systems required, when smaller gears coupled to Smart Drive software can achieve periodic errors of 5 arc secs or less—an observatory standard of precision.

Smart Drive programming is done through the telescope's hand controller.

All worm/worm-gear combinations, no matter how well made, have minor inaccuracies that manifest themselves as periodic errors in the telescope tracking rate, with the period dependent on the worm's rate of rotation. To program the Smart Drive, the observer guides on an object visually, making corrections with the handbox controller. The software then remembers these keystrokes, stores them in memory, and in the future *automatically* compensates for the periodic errors of the gear system.

Smart Drive user programming is stored in the telescope's computer memory forever, independently of any power source, unlike other periodic error correctors that must be reprogrammed each time you use the system. The Smart Drive can be erased, updated, or even averaged with future programmings at the user's option.

The significant value of the Smart Drive is immediately appreciated during long-exposure astrophotography, where the resultant low periodic error of the system enables relaxed guiding with a minimum of handbox corrections. In CCD imaging, where 2- to 3-minute exposures of deep-space objects are often all that is required for stunning results, the Smart Drive often permits imaging without any guiding requirements at all.

The Smart Drive is a tremendous aid in obtaining high-quality, long-exposure images, such as this 2-hour exposure of the Spiral Galaxy (M81) in Ursa Major by Philip Perkins.

Meade® Model 1220 Field De-rotater

for Meade LX200GPS Telescopes

Meade LX200GPS telescopes may be operated in the altazimuth mode (*i.e.,* without polar alignment) for all visual applications and for photographic or CCD imaging exposures of up to about five minutes' duration. Most LX200GPS owners use their telescope in the altazimuth mode the great majority of the time. During longer photo or CCD exposures in the altazimuth mode, however, an effect called *field rotation* becomes evident.

Meade #1220 Field De-rotater *(arrow),* shown with #62 T-Adapter and 35mm camera body attached to a Meade 10" LX200GPS, ready for long-exposure astrophotography.

Simply put, even if the telescope is *perfectly* guided on a central star during a long exposure, stars at the edge of the field appear to rotate about the field center during the exposure. As a result, stars away from the field center appear as small concentric arcs on the film, rather than star-points. This effect, which in no way relates to the accuracy of the telescope's computer or internal alignment, occurs on all altazimuth-mounted telescopes, whether large observatory telescope or LX200GPS, and is caused by the telescope not being polar aligned.

Field rotation with an LX200GPS (or with their predecessor LX200 models) can be cured with the simple addition of an equatorial wedge (see, *e.g.,* p. 29 or 45); the wedge enables precise polar alignment, negating all field rotation. Alternately, the optional #1220 Field De-rotater may be attached to the rear cell of any 7", 8", 10", 12", or 14" Meade LX200 or LX200GPS model, simplifying field operation of the telescope, since no wedge is required. With the #1220 De-rotater attached to the telescope's rear cell, other accessories (T-Adapter, Off-Axis Guider, etc.) can in turn be threaded to the #1220 unit.

The #1220 is easy to use! Just align the LX200GPS telescope as usual, using the GPS alignment procedure or one of six other available alignment procedures, and, automatically, signals are fed through one of the RS-232 ports on the LX200GPS control panel to the Field De-rotater, causing it to rotate at the correct speed and precisely counter the effects of altazimuth-induced field rotation. The #1220 Field De-rotater is powered through connection with the RS-232 serial port.